
N9029AV01-V19, V1B, V2B

Signal Analyzer Frequency Extension Module and Accessories

The Keysight N9029AV01-V19, V1B, and V2B Signal Analyzer Frequency Extension (SAX) Modules are manufactured by Virginia Diodes, Inc. (VDI).

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Safety Notices

CAUTION

A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

WARNING

A **WARNING** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Keysight Technologies

N9029AV01-V19, V1B and V2B

Signal Analyzer Frequency Extension Module and Accessories

The Keysight N9029AV01-V19, V1B and V2B Signal Analyzer Frequency Extension (SAX) Modules are manufactured by Virginia Diodes, Inc. (VDI). The Mixer/Amplifier/Multiplier Chain (MixAMC) modules are for use with the Keysight X-Series Signal Analyzer with the External Mixer Option (EXM), required.

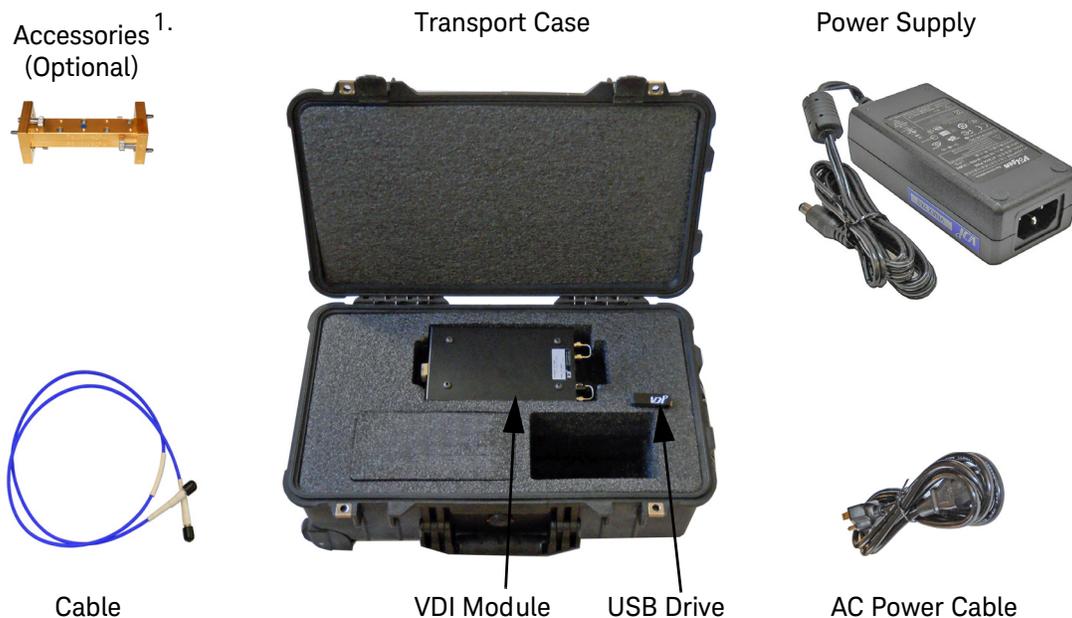
The modules provide high performance broadband frequency down-conversion, and for modules with Option UDC, frequency up-conversion. The modules can be used with microwave signal analyzers to extend the frequency range into the THz range. These modules achieve low conversion loss and excellent noise figure. Refer to the VDI User's Guide included on the USB drive.

For more information, see the Product Manual at https://www.vadiodes.com/images/Products/SAX/SAX_Product_Manual/VDI-731_SAX_Product_Manual.pdf.

For specifications, see the VDI web page at https://www.vadiodes.com/images/Products/SAX/VDI_SAX_Specifications_20201110.pdf.

The cables and power supply will be included with the module in the transport case. Cutouts have been created for the accessories within the transport case, simply remove the foam insert.

Accessories (amplifiers, attenuators, filters, and waveguide sections) available for order¹.



1. To order accessories, see **Accessories and Information on page 12**. For the **Keysight Millimeter Wave Frequency Extenders, Technical Overview** document, visit <http://literature.cdn.keysight.com/litweb/pdf/5991-3161EN.pdf>

CAUTION

Be aware of the power level applied to the waveguide input. Non-warranted damage to the internal mixer can occur if the power level is at or above the damage level specified in the VDI User's Guide for "RF Input."

NOTE

Before using your SAX module, please read all documentation from VDI (included on the USB drive).

Typical Connection Diagram for External Mixing

**NOTE**

The product serial number is the OEM serial number **SAXxxxx** (xxxx = numbers in the OEM serial number) assigned by Virginia Diodes, Inc. Refer to the label on the product for the serial number.

Table 1 SAX Modules

Keysight Model	VDI Model	Frequency (GHz)
N9029AV01	WR1.0SAX	750 to 1100
N9029AV1B	WR1.5SAX	500 to 750
N9029AV2B	WR2.8SAX	260 to 400
N9029AV02	WR2.2SAX	325 to 500
N9029AV03	WR3.4SAX	220 to 330
N9029AV04	WR4.3SAX	170 to 260
N9029AV05	WR5.1SAX	140 to 220
N9029AV06	WR6.5SAX	110 to 170
N9029AV08	WR8.0SAX	90 to 140
N9029AV10	WR10SAX	75 to 110
N9029AV12	WR12SAX	60 to 90
N9029AV15	WR15SAX	50 to 75
N9029AV19	WR19SAX	40 to 60

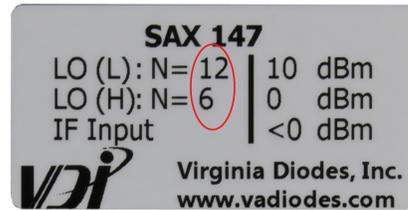
Table 2 SAX Options

Option	Description
DC9	Standard SAX with 9 VDC supply
UDC	Adds IF input data (on USB) for frequency up-conversion
D48	Adds data on USB down to 48 GHz (for N9029AV15 only)
D73	Adds data on USB down to 73 GHz (for N9029AV10 only)
HS0	DC9 SAX with high sensitivity
MCF	Adds Mixer Cal Files for Automotive Radar Solution (for N9029AV12 only)

NOTE

Always use the information printed on the SAX label of your module.

- When using the **LO/IF (L) Input** (External Mixing), use **LO (L): N= X**, with "X" being the multiplication factor value shown on your SAX label.
- When using the **LO/IF (H) Input**, use **LO (H): N= X**, with "X" being the multiplication factor value shown on your SAX label.



On the SAX label, the multiplication factor values are circled. This is an example only; the actual values will vary.

When using your signal analyzer with the SAX, you must set the analyzer to external mixing, including harmonic and Doubler Switched parameters.

For the N90x0A Models:

[Input/Output] > External Mixer > External Mixer > Ext Mix Setup > Edit Harmonic Table > [Enter] (or select OK).

Table Type > Doubler Switching > Harmonic > [N] > Enter N value (see SAX label on module, or see VDI document, for N value)

For the N90x0B Models:

[Input/Output] > Select Input > External Mixer > External Mixer Setup > Table Type > Doubler Switching > Harmonic (under Harmonic Table) > Enter N value (see SAX label on module, or see VDI document, for N value)

NOTE

For improved spurious response:

- Change the number of sweep points:
[Sweep/Control] > Points > [40001]
Multi-Touch Sweep > Sweep Config > Points > [40001]
- Reduce resolution bandwidth:
[BW] > Res BW > [300 kHz]
- Turn on Signal ID:
[Input/Output] > External Mixer > Signal ID > On > Signal ID Mode > Image Suppress
Multi-Touch Input > Output > Signal ID > On > Signal ID Mode > Image Suppress

There is data on the USB drive that can be used to create a corrections file to improve amplitude accuracy.

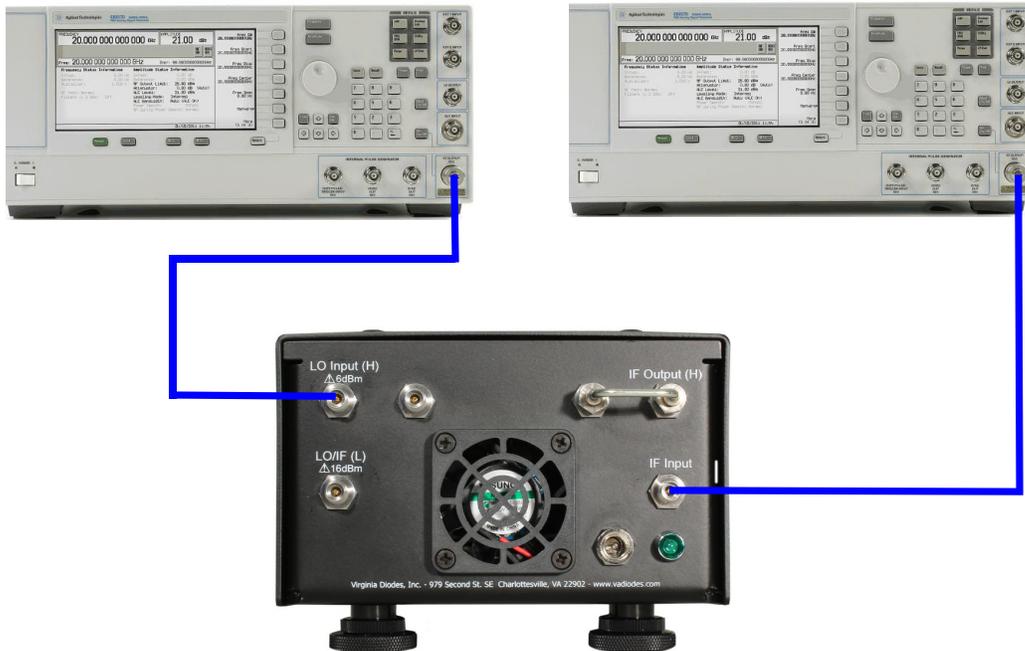
Frequency Up-Converter Operation

The option UDC has an IF input and 9 volt connections for external devices. For frequency up-conversion, the left jumper is to be removed.



The IF input frequency will be up-converted to the multiplication factor of the LO input (H) ++ IF input $\{N \times LO\ input\ (H) + IF\ input = waveguide\ output\ frequency\}$. Refer to the VDI User's Guide for frequencies and power levels.

1. Connect RF source to LO input (H), such as an E8257D PSG.
2. Connect RF signal to be up-converted to the IF input, such as an E8257D PSG.



NOTE

Other modes of operation may be found in the VDI documentation.
**The specifications for the older modules (N9029AVxx) are only in the [VDI-731.3 Mini SAX Manual.pdf](#)*

NOTE

Maximum conversion loss of WR-15, WR-12, WR-10 SAX is 4 dB at the High IF Port after IF amplification.

Power Requirements

- **Voltage and/or range (V):** 100-240 Vac (AC input for AC/DC adapter), 9 Vdc (input for module)
- **Frequency and/or range (Hz):** 50-60 Hz (AC input for AC/DC adapter)
- **Power in Watts, VA or Current (A):** 1.2 A max (input for AC/DC adapter), 4 A (input for module)

NOTE

The instrument can operate with mains supply voltage fluctuations up to $\pm 10\%$ of the nominal voltage.

Install the instrument so that the detachable power cord is readily identifiable and is easily reached by the operator. The detachable power cord is the instrument disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the instrument. Alternatively, an externally installed switch or circuit breaker (which is readily identifiable and is easily reached by the operator) may be used as a disconnecting device.

Environmental Conditions

- For indoor use only

CAUTION

This product is designed for use in INSTALLATION CATEGORY II and POLLUTION DEGREE 2.

NOTE

The input terminals for this product are classified as Measurement Category None.

Cleaning

NOTE

Cleaning connectors with alcohol shall only be done with the instrument's power cord removed and in a well-ventilated area. Allow all residue alcohol moisture to evaporate and the fumes to dissipate prior to energizing the instrument.

WARNING

To prevent electrical shock, disconnect the instrument from mains before cleaning. Use a dry cloth or one slightly dampened with water to clean external case parts. Do not attempt to clean internally.

Safety and Information

WARNING

Use the Keysight supplied power cord or one with the same or better electrical rating.

WARNING

No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock do not remove covers.

WARNING

The Mains wiring and connectors shall be compatible with the connector used in the premise electrical system. Failure to ensure adequate earth grounding by not using the correct components may cause product damage and serious injury.

WARNING

If this product is not used as specified, the protection provided by the equipment could be impaired. This product must be used in a normal condition (in which all means for protection are intact) only.

WARNING

Safety of any system incorporating the equipment is the responsibility of the assembler of the system.

CAUTION

This instrument has auto-ranging line voltage input. Be sure the supply voltage is within the specified range and voltage fluctuations do not to exceed 10 percent of the nominal supply voltage.

NOTE

Before using your converter module, please read all documentation from VDI (included on the USB drive). It is important to follow the General Operating Procedures and Guidelines section.

NOTE

This product has been designed and tested in accordance with accepted industry standards and has been supplied in a safe condition. The documentation contains information and warnings that must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

NOTE

Only Keysight approved accessories shall be used.

NOTE

The main power cord can be used as the system disconnecting device. It disconnects the mains circuits from the mains supply.

Instrument Markings

Listed below are definitions for the markings that may be found on the product.



The instruction documentation symbol. The product is marked with this symbol when it is necessary for the user to refer to the instructions in the documentation.



The AC symbol indicates the required nature of the line module input power.



This symbol indicates separate collection for electrical and electronic equipment, mandated under EU law as of August 13, 2005. All electric and electronic equipment are required to be separated from normal waste for disposal (Reference WEEE Directive, 2002/96/EC).



This symbol indicates that the power line switch is ON.



This symbol indicates that the power line switch is in the OFF position.

IP 2 0

The instrument has been designed to meet the requirements of IP 2 0 for ingress and operational environment.



The RCM mark is a registered trademark of the Australian Communications and Media Authority.



Indicates the time period during which no hazardous or toxic substance elements are expected to leak or deteriorate during normal use. Forty years is the expected useful life of the product.



The CE mark is a registered trademark of the European Community.

ccr.keysight@keysight.com

The Keysight email address is required by EU directives applicable to our product.



This is a symbol of an Industrial Scientific and Medical Group 1 Class A product (CISPR 11, Clause 5).

ICES/NMB-001

This is a marking to indicate product compliance with the Canadian Interference-Causing Equipment Standard (ICES-001). Cet appareil ISM est conforme à la norme NMB du Canada.



This symbol on all primary and secondary packaging indicates compliance to China standard GB 18455-2001.



South Korean Certification (KC) mark; includes the marking's identifier code which follows this format: MSIP-REM-YYY-ZZZZZZZZZZZZZ.

Safety

Complies with the essential requirements of the European Low Voltage Directive.

EMC

Complies with the essential requirements of the European EMC Directive as well as current editions of the following standards (dates editions are cited in the Declaration of Conformity):

- IEC/EN 61326-1
- CISPR Pub 11 Group 1, Class A
Caution: This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.
- AS/NZS CISPR 11
- ICES/NMB-001
This ISM device complies with Canadian ICES-001.
Cet appareil ISM est conforme a la norme NMB-001 du Canada.

To find a current Declaration of Conformity for a specific Keysight product, go to:

<http://regulations.about.keysight.com/DoC/search.htm>

South Korean Class A EMC Declaration

If there is a "KC" mark on the product, then the following statement applies:

This equipment has been conformity assessed for use in business environments. In a residential environment, this equipment may cause radio interference.

※ This EMC statement applies to the equipment only for use in a business environment.

사용자 안내문
이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

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Acoustic Statement (European Machinery Directive)

Acoustic noise emission

LpA < 70 dB

Operator position

Normal operation mode per ISO 7779

NOTE

This is a sensitive measurement apparatus by design and may have some performance loss (spurs up to 55 dB above a noise floor) when exposed to ambient continuous electromagnetic phenomenon in the range of 80 MHz - 6 GHz when tested per IEC 61000-4-3.

Accessories and Information

A list of accessories can be found on the N9029AV99 Waveguide Accessories for mm-Wave Product Note (N9029-90035) at <https://www.keysight.com/us/en/assets/9921-01743/user-manuals/N9029AV99-Millimeter-Waveguide-Accessories-Product-Note.pdf>.

For information concerning the operation and connections, reference the VDI User Guide (included on the USB Drive), or the Keysight X-Series Signal Analyzer's documentation by searching http://www.keysight.com/find/pxa_manuals. You may also reference the X-Series Signal Analyzer On-line Help System for operational information. Information is also available at <http://vadiodes.com>

Keysight Technologies does not guarantee the performance of the VDI modules, or system performance. However, if warranty or repair is needed Keysight will provide full support to our customer.

Inspect the shipping container. If the container or packing material is damaged, it should be kept until the contents of the shipment have been checked mechanically and electrically. If there is mechanical damage or if the instrument does not pass the performance tests, notify the nearest Keysight Technologies office. Keep the damaged shipping materials (if any) for inspection by the carrier and a Keysight Technologies representative.

When shipping the product to Keysight for repair, use original or comparable packaging.

Contacting Keysight

Assistance with test and measurement needs, and information on finding a local Keysight office are available on the Internet at:

<http://www.keysight.com/find/assist>

You can also purchase accessories or find documentation items on the Internet at:

<http://www.keysight.com/find>

If you do not have access to the Internet, contact your field engineer.

NOTE

In any correspondence or telephone conversation, refer to the Keysight product by its model number and full serial number. With this information, the Keysight representative can determine the warranty status of your unit.

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